Impact matrix analysis and cost-benefit calculations to improve management practices regarding health status in organic dairy farming

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- Deliverable -

D9.4 – Report on the preconditions for an effective use of phytotherapy in pig and poultry production

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Executive Summary

This report provides an overview with respect to the current use of phytotherapeutic remedies on pig and poultry farms in France, Germany, Netherlands and Spain. For this purpose a questionnaire was developed to assess the context and the surrounding conditions in which these remedies are used in poultry and pig farming practice. Additionally, the legal conditions concerning the approval procedure of phytotherapeutic products were reflected for their possible impacts. A total of 51 interviews were completed by veterinarians or feed advisors from France, Germany, Netherlands and Spain, using phytotherapy. The results of the survey showed a considerable heterogeneity in the use of phytotherapeutic products. In many cases, essential preconditions for a target-oriented and effective use of phytotherapeutic products were missing. It is concluded that the legal classification of these products, insufficient information about the ingredients together with inappropriate diagnostic procedures and control of treatment success as well as a limited availability of expertise on the farm level are questioning a relevant therapeutic effect. Under these conditions, the use of phytotherapeutic products are seen as hardly relevant as an option for reducing the use of antibiotics.

Dissemination Level

| PU | Public | PU |
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1 Introduction

Plants and their derivates have been used for health improvement purposes since ancient times. The practice of traditional herbal medicine has led to the development of phytotherapy, the study of modern scientific herbal medicine where the molecular interactions between plant components and host cells are studied to provide evidence based treatments (Wynn & Fougere, 2007). The pillars of modern phytotherapy are based on an integrative approach, taking the individual unique symptoms, general health and interactions with environment into account to enable prescription of a remedy specifically designed to the individual (Fougère, 2007). Individual farm approach would be needed for effective health planning, instead of focusing on general recommendations (Selle et al., 2014).

The Encyclopaedia Britannica defines phytotherapy as a science based on medical practice where plant-derived medications are used in the treatment and prevention of diseases by defining and standardizing the content of active substances through pharmacological tests and clinical trials. This way of looking at it is in many ways very similar to the development of chemosynthetic pharmaceuticals where an active substance is identified and purified. However, the encyclopaedia also recognizes that there is confusion regarding the terminology. Herbalism, botanical medicine and phytotherapy are often mixed up and thus it may be difficult to separate different types of approaches from one other (Wynn & Fougere, 2007), which might lead also to a varying use in farm practice.

Herbal products are currently used by the feed industry largely as sensory additives, flavoring and appetizing substances (Franz et al., 2009). Mainly regulated by 1831/2003/EC (additives for animal nutrition purposes), phytogenic feed additives used as growth promoters were generally registered as “sensory additives”, for which no demonstration of efficacy was required before March 2013. From the regulatory point of view, the borderline between herbal medicines (see glossary) and phytogenic feed additives (see glossary) is not clear, and can be distinguished only when the intended application is demonstrated (Table 1). Due to this situation, companies and authorities are frequently confronted with the need to distinguish between veterinary medicinal products, feed additives, biocidal products and other products due to legal uncertainties (EC 2014/257 COD).

In general, the use of phytotherapy has an affinity to organic agriculture. The remedies are in accordance with the concept to preferentially use medical substances obtained from natural sources, which could circumvent, or reduce, the use of chemicals that may be harmful to either the environment or human beings (Vaarst et al., 2004). Furthermore, the current EC Regulation for Organic Farming (EC 834/2007) states that in organic livestock phytotherapeutic products shall be used in preference to chemically-synthesised allopathic veterinary treatment or antibiotics, provided that they are effective for the species of animal, and the condition for which the treatment is intended.

However, phytotherapy might be used in both organic and conventional farming. In both concepts there is a need of reducing the routine use of antibiotics, which could limit the availability of medical interventions to prevent and control animal diseases on the farm. These restrictions might directly impact global food security and safety as well as animal and human health (Seal et al., 2013), highlighting the need of reliable alternatives. This is in line with the European Commission 5-year action plan launched in 2011, which includes twelve actions to tackle antimicrobial resistance covering areas such as ‘development of new effective antimicrobials or alternative treatment’. The Global Action Plan on Antimicrobial Resistance (WHO, 2015) also highlights the current need of research to identify alternatives to non-therapeutic uses of antimicrobial agents in agriculture and aquaculture, including their use for growth promotion.
Table 1. General principles of use of phytogenic feed additives vs. veterinary drugs (adapted from Franz et al., 2010)

<table>
<thead>
<tr>
<th></th>
<th>PHYTOGENIC FEED ADDITIVES</th>
<th>HERBAL VETERINARY MEDICINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>User/applicant</td>
<td>Farmer, feed advisor</td>
<td>Veterinarian only</td>
</tr>
<tr>
<td>Animals</td>
<td>Healthy animals</td>
<td>Sick animals</td>
</tr>
<tr>
<td>Aim of use</td>
<td>Situation does not escalate to the point where use of conventional medication needed. Increase performance, enhance immune system, stabilize microbiota</td>
<td>Restore health</td>
</tr>
<tr>
<td>Duration of use</td>
<td>Usually long, continuous administration or lifetime</td>
<td>Usually short periods or Temporal</td>
</tr>
<tr>
<td>Authorisation costs &amp; market prices</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Antimicrobial resistance</td>
<td>Not often</td>
<td>Yes (i.e. antibiotics)</td>
</tr>
</tbody>
</table>

1.1 Preconditions for the use of phytotherapy

Due to the multifactorial nature of production diseases, a system approach is needed to deal with animal health problems. Although numerous studies have demonstrated efficacy in vitro, respective experimental in vivo evidence is still quite limited (Windisch et al., 2008), probably due to the high variability in the factors that affect the outcome on the farm. Therefore, although many studies tend to conclude that phytherapeutic remedies have potential, it is not possible to draw firm conclusions until all necessary preconditions for their use are identified and granted.

The efficacy of any action to promote health on the farm, including the use of herbal remedies, cannot be limited only to the concentration of pharmaceutical active ingredients alone and cannot be isolated from the context in which it is used, but is highly farm context-variant. The success emerges from the complex interactions of various factors. Thus, the appropriateness of phytotherapy is not only related to the effectiveness of the remedies itself, which have to be proven in clinical control studies, but depends to a high degree also on the appropriateness of initial and boundary conditions on the farm.

Preconditions for the use of phytotherapy are then defined as the conditions that must exist or be established before something can occur or be considered. In the context of this report, preconditions represent prerequisites, under which management measures can be implemented, and demarcate the options and potentials for an efficient use of phytotherapy. Preconditions include among others: skills in the diagnostic procedure, expertise to select the appropriate herbal product according to the leading symptoms of illness and availability of expertise in phytotherapy.
1.2 Use of phytotherapy in pig and poultry production

The antimicrobial activity of plant oils and extracts has been recognized for many years, and they are being further investigated as potential natural alternatives to antibiotics (Hammer et al., 1999). However, in the past insufficient attention has been given to the alternatives to antimicrobials in order to meet equivalent standards of quality, safety, and efficacy (Seal et al., 2013). Furthermore, their application in food animal production has been largely limited due to their inconsistent efficacy (Yang et al., 2015). Inefficacy and inappropriate use of phytotherapeutic products might decrease animal health and welfare instead of improving them, regardless of the potential of the particular product. Antibiotics have long been extensively used at sub-therapeutic levels in swine, poultry and ruminant diets to improve growth performance. A wide variety of alternatives have been studied in these species as potential alternatives for antibiotics, such as probiotics, prebiotics, antimicrobial peptides, and phytopharmacological compounds. However, the best alternative to antibiotic growth-promoters is a general improvement of the living conditions of food producing animals (Hughes & Heritage, 2002).

Managing animal health in many farms can be done at different levels of intervention (Figure 1). Baseline measures are those on the level of breeding and production chain work on the long term (i.e. choice of breeds or types and national agreements on vaccinations). Next level of action deals with management to create optimal conditions in the farm system, in terms of feeding, climate, housing, hygiene and vaccinations. Natural products could be used to improve digestion, resistance and general health to prevent diseases or support recovery, so the situation does not escalate to the point where only medication can help. In the last level, acute cases of animal disease, medication will be used. If this is successful, the problem will be solved in the short term. Damage has, however, already been done due to diminished growth or production as part of the impact on animal health and welfare, a higher mortality, together with additional direct costs in medications (Groot, 2010).

![Figure 1. Levels of intervention to manage animal health, adapted from Groot (2010).](image)

2 Objectives

As there have been no studies providing sufficient information about the use of phytotherapy in livestock farming, the aim of this study is to identify and assess the preconditions for the use of phytotherapy in pig and poultry farming in an European context to assess the prospects of using botanical products for the sake of animal health and welfare and food safety. This survey is primarily focused on those infectious diseases and species in which antibiotic treatment is often used. These
are respiratory and gastrointestinal infectious diseases in pig and poultry production. Moreover, the availability of expertise and infrastructure with respect to the diagnostic procedure and the treatment, which are required for making appropriate use of phytotherapeutic remedies in veterinary practice will be assessed. A third aim is to provide an overview on the legal considerations and to give an insight into the regulatory uncertainties that phytotherapeutic products currently face.

3 Legal considerations: regulations for the use of phytotherapy

Legal uncertainties are assumed as one of the most relevant barriers for the use of phytotherapeutic remedies when treating diseased animals. In order to provide an overview about the legal situation in France (FR), Germany (DE), Netherlands (NL) and Spain (ES), a consultation was sent to national project partners. The content of this consultation was information regarding the amount of veterinary and non-veterinary herbal products authorised, together with national regulations on the rededication of medicinal products. First and foremost, the European legal regulations valid for all European countries were assessed with the respect to the opportunity to treat food-producing animals with phytotherapy. Transposing of European regulations into national law was mainly demonstrated by the example of Germany, because here more extensive information were available than in the other participating countries.

In general, the EU legislation on medicinal products for veterinary use (Directive 2001/82/EC) applies to all substances administered to animals to treat or prevent disease, thereby including phytotherapeutic remedies. Directive 2001/82/EC also pronounce that veterinary medicinal products for the treatment of food-producing animals require a veterinary prescription. However, Directive 2006/130/EC allows an exemption from the general rule if the product can be considered very safe and without negative side effects for the users, animals, consumer and environment. Another restriction in the case of treatment of food producing animals is that all substances administered have to have a maximum residual limit (MRL) in accordance with Regulation 37/2010/EC (Tamminen et al., 2016).

Manufacturers of medicinal products can apply for a central approval by the European Medicinal Agency (EMA) or for a national approval by the national medicinal agencies. Such approval requires a full medicinal registration procedure (see Figure 2) with documentation on product safety, quality, pharmacological and clinical trials. However, the pre-clinical and clinical trials may be excluded if the applicant can demonstrate by detailed references to published scientific literature that the constituents of the product has a well-established medicinal use at an acceptable level of efficacy and safety.

Until now, no phytotherapeutic remedies for animals have been centrally approved as veterinary medicinal products by EMA. The total number of veterinary herbal remedies approved in the different member states in the European Union and to which extent they require veterinary prescription is not available (Tamminen et al., 2016). A common database of veterinary herbal remedies approved in European countries is still non-existent.

Herbal substances are also available as animal feed additives regulated by Regulation EC/1831/2003. There is only a fine line between veterinary herbal medicine and animal feed additives. The main difference is their intended application as is shown in Figure 3. The directives regarding food supplements for human use are different and more severe than the ones that apply to food and food additives for animals. The latter are regulated by 1831/2003/EC about additives for animal nutrition purposes and the labelling and marketing is regulated in 767/2009/EC. Selling feed additives with claims concerning optimisation of nutrition, support or protection of the physiological conditions is permitted, unless they do not contain a claim declaring that it will prevent, treat or cure
a disease (767/2009/EC, article 13). Regarding the prevention of disease, there is an exception for coccidiostatic and histomonostatic products. These types of products may be sold as feed additives classified in a special category included in the legislation (1831/2003/EC), see chapter “use of herbal non-veterinary medicinal products” (Tamminen et al., 2016).

Figure 2: Steps in the process of drug authorization (adapted from Gracia Lorente, 2011, non-scientific communication). HMP- Herbal medicinal product. THMP – Traditional Herbal Medicinal product. SPC – Summaries of Product Characteristics. PIL – Patient Information Leaflet. WEU – Well Established Use.

Figure 3: Use of botanicals in legal frameworks (adapted from Coppens (2013), non-scientific communication).
Regarding feed products with specific claims in relation to specific effects, scientific substantiation must be submitted. Purchasers have the right to bring to the attention of the competent authority their doubts in respect of the truthfulness of the claim. Only additives that have been through an authorisation procedure by the European Food and Safety Authority (EFSA) and included in Annex I 1831/2003/EC may be placed on the market. Requirements for authorization of an additive are no negative effects on the environment, human or animal health and a positive effect on the feed, like for example improving the quality, the nutritional content, the environmental effect of the production, the production in itself or have a coccidiostatic or histomoniostatic effect. Authorisations are granted for specific animal species, specific conditions of use and for a period of ten years (Doehring et al., 2016).

In March 2013 (EU 230/2013) over 600 plants, belonging to the group “flavouring and appetising substances”, were withdrawn from the commercial market (see Table 2). As regards the use of the feed additives specified in Part A and B of the Annex as flavouring and appetising substances, no applications for authorisation in accordance with Article 10(2) of Regulation (EC) No 1831/2003 or Directive 70/524/EEC were submitted before the deadline for all or some of the animal species or categories of animal species for which the feed additives concerned had been authorised.

Table 2: Withdrawn herbal substances in March 2013; *8 of them are also listed in part A

<table>
<thead>
<tr>
<th>Categories</th>
<th>Number of withdrawn herbal substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A: all animals</td>
<td>608</td>
</tr>
<tr>
<td>Part B: some of the animal species or categories of animal species (all species with exception of cats, dogs and/or other carnivorous and omnivorous companion)</td>
<td>10*</td>
</tr>
<tr>
<td>Total</td>
<td>610</td>
</tr>
</tbody>
</table>

As transitional period for interested parties within which existing stocks of the additives concerned, pre-mixtures, compound feed and feed materials which have been produced with those additives was permitted (see Table 3).

Table 3: Transitional periods for withdrawn herbal substances

<table>
<thead>
<tr>
<th>Categories</th>
<th>End of transitional period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing stocks of the feed additives set out in part A and B</td>
<td>10th April 2014</td>
</tr>
<tr>
<td>Premixtures produced with the additives in part A and B</td>
<td>10th October 2014</td>
</tr>
<tr>
<td>Compound feed and feed materials produced with the additives in part A and B or with above mentioned pre-mixtures and which have been labeled in accordance with Regulation (EC) No 767/200</td>
<td>10th April 2015</td>
</tr>
</tbody>
</table>
As soon as a curative or preventive effect is announced, a product falls under the legislation on veterinary medicines. A French bulletin provided by the National Agency for Food Safety (ANSES) claims that alternative therapeutic treatments for animals need to be either veterinary medicines with administrative approval for the ANMV (Agency for Veterinary Medicinal Products) or magistral formulae with veterinary prescription. Self-medication by farmers is strictly forbidden and will be punished for violating the law with production interdiction/distribution, financial penalties or sending a file to the courts for further sanctions (ANSES, 2013).

When no authorized veterinary product is available in the member state for a specific condition, the “Cascade system” (Directive 2004/28/EC) allows veterinarians under his/her own personal responsibility to rededicate the herbal medicinal product. Herbal based remedies can be prescribed to food-producing animals in five different ways:

1. Use of approved veterinary medicinal products;
2. Use of homeopathic remedies of herbal origin in low potencies;
3. Rededication of human herbal products by veterinarians;
4. Preparation of herbal products by veterinarians or by pharmacists;
5. Use of non-veterinary herbal products with or without “health claims”.

Although it seems that there are a lot of administration options, the factual availabilities are very restricted by different legal conditions. The following sections show the opportunities and constraints of each way of administration.

3.1 Use of approved veterinary medicinal products

In France, Netherlands and Spain, there are currently no or only few approved herbal veterinary medicinal remedies on the commercial market available in order to treat food-producing animals with phytotherapy. In Germany, all purely herbal veterinary medicinal products (see Table 4) being on the market for use in food-producing species are for traditional use, registered according to Sections 39b and 39c resp. Section 109a German Drug Act (last amended 2014). This means that they have undergone a simplified registration procedure similar to the process for human traditional herbal medicinal products described in Directive 2004/24/EC and as such they are to be sold over-the-counter” (Tamminen et al., 2016). In total, only six veterinary herbal and three anthroposophic products are currently available on the market, but only seven of them for pigs and three for chicken. The indications of the six approved herbal based products are prevention of diarrhoea and supporting the gastrointestinal tract, disinfection of hoof and claw, support against udder disease and support the organ function of the respiratory tract and the skin (see Table 4). In contrast to purely herbal products, anthroposophic (see glossary) remedies are available only on prescription or in pharmacies.

The requirements for registration of veterinary medicinal products are aimed at single synthetic substances. Complex herb extracts cannot comply with the quality demands for composition, and the fact that all components of a herb needs to be declared quantitatively. Not all components of herbal plant extracts are, however, known (and neither are those of feed products). Furthermore, combinations of herbs are seen as complex veterinary medicinal products. Hence, the efficacy of the combination must be proven to be better than that of each of the individual composing elements. Other bottlenecks are the high financial costs and the ever stricter criteria that are used in the registration procedure over the years. The herbal substances that are registered now concern old veterinary medicinal products with registration dossiers that probably would not be accepted today (Groot et al., 2007).
Table 4: Availability of approved veterinary herbal based remedies; research by Federal Office of Consumer Protection and Food Safety Germany (BVL), 2015 green – approved for pigs and/or poultry; Red – not approved for pigs and/or poultry

<table>
<thead>
<tr>
<th>Product</th>
<th>Indication</th>
<th>Species / Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Herbal based products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eukalyptusöl® (eucalyptus oil)</td>
<td>Traditionally used in support of the organ function of the upper respiratory tract (inhalation, oral use) and the skin (dermal application)</td>
<td>Cattle, pig, sheep, goat, horse, cat, dog Over-the-counter-drug</td>
</tr>
<tr>
<td>Euterbalsam® (udder ointment)</td>
<td>Traditionally used as a mild-action medicinal product for prevention against diseases of the udder and to support its functioning</td>
<td>Cattle, sheep, goat, horse Over-the-counter-drug</td>
</tr>
<tr>
<td>Klausan-Paste®</td>
<td>Traditionally used as a mild-action medicinal product for disinfection of hoof and claw and to strengthen the horn</td>
<td>Cattle, pig, sheep, goat, horse Over-the-counter-drug</td>
</tr>
<tr>
<td>Rurex®</td>
<td>Traditionally used as a mild-action medicinal product for prevention against diarrhea and to support the functioning of the gastrointestinal tract</td>
<td>Cattle, pig, sheep, goat, chicken Over-the-counter-drug</td>
</tr>
<tr>
<td>Ventrarctin®</td>
<td>Traditionally used as a mild-action medicinal product for use in unspecific diarrhea and to support the functioning of the gastrointestinal tract</td>
<td>Cattle, pig, sheep, goat, chicken, dog Over-the-counter-drug</td>
</tr>
<tr>
<td>Ventrasan N®</td>
<td>Traditionally used as a mild-action medicinal product for additional therapy of non-infectious gastro-enteritis</td>
<td>Cattle, pig, sheep, goat, horse, rabbit, chicken, dog, mink Over-the-counter-drug</td>
</tr>
<tr>
<td><strong>Anthroposophic products</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crataegus ad. us. vet.®</td>
<td>Traditionally used in support of the heart and circulation function</td>
<td>Dog, cat, horse Cave: rededication to food-producing animals forbidden</td>
</tr>
<tr>
<td>Coffea praeparata oral®</td>
<td>For prophylaxis and therapy of diarrhoea and respiratory disease of juveniles, therapy supplemental care in case of reduced general condition, loss of appetite/thirst, febrile disease and circulatory/respiratory/gastrointestinal disturbance</td>
<td>Cattle, pig, sheep, goat, horse, rabbit, dog, cat, guinea pig Cave: pharmacy restricted remedy</td>
</tr>
<tr>
<td>EucaComp PlantaVet®</td>
<td>For local treatment of genital tract inflammation (discharge) and endometritis</td>
<td>Cattle, pig, horse Cave: available only on prescription</td>
</tr>
</tbody>
</table>
3.2 Use of other alternative remedies: homeopathic remedies in low potencies

Due to the same herbal raw materials, homeopathic remedies in low potencies (less than < D4) may contain ingredients in allopathic doses. Thus, they should be treated the same way as allopathic herbal remedies (Csúpor et al., 2013). According to the drug law, only homeopathic remedies, which contain active substances listed in Table 1 of Commission Regulation (EU) No 37/2010, are allowed to be used for treating food-producing animals. In Germany, the administration of homeopathic remedies provides an advantage in comparison to other herbal based products, because of the special regulation for homeopathic remedies (§12a TÄHAV, 2009). This allows a withdrawal period of zero days for listed homeopathic active substances in Table 1 of the Commission Regulation (EU) No 37/2010, unless explicitly indicated otherwise. However, this option to administer herbal based remedies to food-producing animals causes difficulties as well:

a) Only a very limited number of low potency homeopathic remedies are listed on Table 1 of Commission Regulation (EU) No 37/2010 for food-producing animals.
b) Homeopathic remedies with low potencies might not achieve the required phytotherapeutic dosage. In order to achieve an appropriate dosage for larger animals, the concentration of administered remedies needs to be increased. However, due to the high costs of these low potency homeopathic products the use is not economically viable for food-producing animals.

3.3 Rededication of human herbal products

A lot of herbal products are available for human use. In Germany, about 600 to 700 plant based medicines are available and are prescribed German physicians. If veterinarians would like to administer human products to food-producing animals, they have to consider the cascade: Directive 2004/28/EC (see Figure 4). The cascade is a legislative provision allowing veterinarians to prescribe unauthorised medicines to animals. The principle of the cascade is that, if there is no suitable veterinary medicine authorised, veterinarians are permitted to treat food-producing animals with human herbal products to avoid unacceptable suffering. The sequence, described in Table 5 has to be considered in descending order of priority:

The use of the cascade is only permitted in case of treatment crisis under consideration of the following conditions:

a) A veterinary medicinal product approved in Germany for a specific indication and species is not available.
b) The animal health is otherwise in serious danger.
c) No direct or indirect risks for the health of humans and animals are associated.
d) Administration or prescribing only by veterinarians or under his/her supervision.
e) The withdrawal period lasts at least 28 days for meat and 7 days for milk or eggs.
In contrast to the use of homeopathic remedies in case of prescribing or administering herbal based medicines to food-producing animals by veterinarians under consideration of the cascade, it is required to specify an appropriate withdrawal period. The compliance of the withdrawal periods serves to avoid harmful pharmaceutical residues in foodstuffs of animal origin. Unless the medicine indicates a withdrawal period for the species concerned, the withdrawal period should not last less than seven days for milk and eggs or 28 days for meat. Particularly for organic farms, which might be the main user group of alternative remedies, a double withdrawal period is determined by the Regulation EU No 889/2008 resulting in 14 days for milk/eggs and 56 days for meat after a rededication of a remedy.

Furthermore in case of rededication of herbal based remedies, veterinarians need to assume responsibility for efficacy and harmlessness of this specific remedy.

In conclusion, the rededication and use of human medicinal herbal products is very expensive and a cumbersome process. Thus, it does not make sense from an economic point of view due to different reasons: the high product price of human medicinal phytotherapeutics, the way of administration, the long withdrawal periods and a disproportionate bureaucratic effort. Concerning the assumption
of responsibility for rededicated herbal based products, some veterinarians would like to keep their own risk at a minimum. Therefore, veterinarians are expected to avoid rededicating herbal products.

3.4 Preparation of herbal products by veterinarians or pharmacists

Another option to use herbal products provides the 4th level of the cascade (see above). Veterinarians are authorised to prepare herbal products in the form of homeopathic remedies or by using finished medicinal products (§13, Abs. 2, No. 3c and §21, Abs. 2a, AMG, 2014). The law requests that only active substances listed in the Table 1 in Commission regulation EU No 37/2010 may be used and no maximum residue limit (MRL) is required. Furthermore, it is necessary to ensure that herbal ingredients need to meet the quality standard of medicinal products. In order to prepare herbal based remedies by a pharmacist, a veterinary prescription is mandatory.

Currently, the preparation of herbal products by vets or pharmacists is a time-consuming and expensive procedure. What makes it even more difficult is the fact that only few basic ingredients are available in stock. An essential requirement to ensure a rapid and cost-effective preparation of these products is recurrent and extensive orders by veterinarians in order to keep a well-stocked storage with basic ingredients.

3.5 Use of herbals as feed additives

Substances derived from plants are also available as feed additives. Selling feed additives with claims concerning optimisation of nutrition, support or protection of the physiological conditions is permitted, unless they do not contain a claim declaring that it will prevent, treat or cure a disease (767/2009/EC, article 13). Regarding the prevention of disease there is an exception for coccidiostatic and histomoniostatic products. Feed additives are classified in categories included in the legislation EC 1831/2003:

1. Technological additives:
   - Preservatives, antioxidants, emulsifiers, stabilisers, thickeners, gelling agents, binders, substances for control of radionucleide contamination, anticaking agents, acidity regulators, silage additives, denaturants

2. Sensory additives:
   - Colorants, flavouring compounds

3. Nutritional additives:
   - Vitamins; pro-vitamins and chemically well-defined substances having similar effect; compounds of trace elements; amino acids, their salts and analogues; urea and its derivatives

4. Zootechnical additives:
   - Digestibility enhancers, gut flora stabilisers, substances which favourably affect the environment, other zootechnical additives

5. Coccidiostats and histomoniostats.

Only additives that have been through an authorisation procedure by the EFSA and included in Annex I 1831/2003/EC may be placed on the market. Requirements for authorization of an additive
are: no negative effects on the environment, human or animal health and a positive effect on the feed, like for example improving the quality, the nutritional content, the environmental effect of the production, the production in itself or have a coccidiostatic or histomonostatic effect (Tamminen et al., 2016). Veterinarians authorised as feed producers are also allowed to prepare feed mixtures of herbal ingredients and feed additives (EU No. 1831/2003).

Currently, there is an unmanageable multiplicity of herbal feed additives available on the commercial market, varying from country to country. According to a report from the European Food and Safety Authority, approximately 600 botanical extracts and some 1800 individual compounds naturally occurring as components of extract are, or have been, used for sensory purposes in feedstuffs until March 2013 (EFSA, 2010). Even after the withdrawal of over 600 herbal substances from the commercial market by the European Union, there are still a lot of herbal substances available. Representative for the availability of different herbal substances a summary on the use of herbal medicinal products and feed additives in Austria from the University of Vienna illustrates the tendency of the use of herbal ingredients as non-veterinary products. Only 9 herbal medicinal products are available on the Austrian market, but almost five times as many herbal feed additives (in total 43 feed additives) (see Table 5).

Table 5: Overview about the availability of herbal ingredients in medicinal products and feed additives / dietary products for animals in Austria, Prof. Dr. C.Franz; MSc Theses VetmedUni Vienna; 2012

<table>
<thead>
<tr>
<th>Plant species</th>
<th>Herbal medicinal products</th>
<th>Feed additives / Dietary products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendula officinalis</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Crataegus oxyacantha</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Cynara scolymus</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Echinacea sp.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Harpagophytum procumbens</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Hypericum perforatum</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Matricaria recutita</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Panax ginseng</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Silybum marianum</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Thymus vulgare</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Valeriana officinalis</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Zingiber officinalis</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>43</td>
</tr>
</tbody>
</table>

Mainly due to the extended withdrawal periods, only 48 different non-veterinary herbal medicines produced by 10 companies remained licensed in Spain in 2013. In the year 2010 315 traditional
herbal medicines (from 39 companies) were available. The EMA (European Medicines Agency) had received just 123 applications from Spain and at least 34% formerly licensed THM (Traditional Herbal Medicine) had shifted to the less strictly regulated food sector, while up to 54% might have disappeared from the market. However, there is still a significant presence of retail websites making illegal health claims (Tejedor-García et al., 2015), causing a “grey area” between veterinary medicinal products and animal feed additives. Feed additives with “health claims”, dietetic and supplementary feed and animal care products belong to this category. The use of feed additives provides a lot of advantages for people who would like to use phytotherapy:

a) Comparable low costs;
b) Easily available.

Nevertheless, administration of herbal substances via feed additives to diseased animals is also of limited use since product quality of herbal based remedies and the therapeutic dosage required cannot be guaranteed. In contrast to veterinary products, a proof of efficacy of non-veterinary herbal products and veterinary expertise in the treatment of diseased animals are not required. Each person can treat diseased animals with those products without knowledge of the effect of herbal substances and animal diseases. Thus, a thorough diagnosis and success control of the given treatment is not ensured.

3.6 Summary

Availability and use of herbal based remedies is hampered due to various reasons. On the one hand, the limited authorised veterinary medicinal products do not provide a basis for an appropriate treatment. Furthermore, homeopathic remedies in low potencies do not reach the required dosage recommendation or the price of the necessary amount of the remedy for large animals is too high. On the other hand, each rededication (e.g. use of human herbal products or preparation of herbal based remedies by veterinarians / pharmacists) under consideration of the cascade causes extended withdrawal periods, so that the use of these products makes little sense from an economic perspective. It can be concluded that although many different ways exist for administration of herbal based products to treat food-producing animals, in the end neither of them is expediently or economically feasible. Therefore, it is not surprising that the use of herbal medicinal remedies is on a low level and the use of non-veterinary herbal products as feed additives has developed as an alternative. Herbal substances (see glossary) are available in different kinds of products without being associated with a withdrawal period. However, this category is lacking any transparency, especially with regard to the quality criteria for their production and the proof of efficacy when used in farm practice. Under the current legal conditions the use of herbal remedies is very restricted and hardly relevant as an option for reducing the use of antibiotics.

3.7 Possible solution approaches

In order to deal with the currently poor situation, the following options should be taken into consideration:

a) Inclusion of harmless plants or herbal active substances, the so-called “Mite-Drugs”, without maximum residual limit into Table 1 of Commission regulation EU No 37/2010.
b) Definition of the “grey area” between veterinary products and animal feed. This new category needs to contain all herbal substances from Table 1 of EU No 37/2010. Furthermore, the quality, authorisation and production criteria for animal feed should also apply for herbal based remedies of this new category. The current use of the strict veterinary medicine criteria as standard should no longer be used. Of course for food-producing animals, documentation obligations for the use of this “grey area”-products have to be implemented to ensure
transparency and traceability. It is necessary to develop a balanced regulatory framework that meet the demands of all interested parties and increase collaboration between them.

c) Simplification of the cascade in order to avoid unnecessary withdrawal periods similar to the exemption for the use of human homeopathic remedies, since "Mite-Drugs" are toxicological harmless in conventional dosages (Striezel, 2005).

d) As the research and authorisation of veterinary herbal products are very expensive, European and national subsidies for research/field projects among new sales opportunities might serve as an incentive for producers of those herbal based products.

e) Transparency from private companies regarding labelling and information about the ingredients provided to users.

f) Particularly, a monitoring scheme concerning prevalence of production diseases on the farm level is required in order to verify a successful treatment.

4 Methodology for interviews with pig and poultry veterinarians and feed advisers who have used phytotherapy

4.1 Elaboration of the questionnaire

A questionnaire to gain an overview of the context and the surrounding conditions in which phytotherapy is used in poultry and pig farming practice in different European Countries was developed within the work group consisting of representatives from France (FR), Germany (DE), Netherlands (NL) and Spain (ES).

The draft questionnaire, initially designed for practicing veterinarians only, was developed by one person (ES), internally reviewed, and followed by each assigned partner. In addition, a sociologist, active in the IMPRO project, was consulted to validate the questionnaire, and methodological approaches of the interviews. Also an epidemiologist in the topic of animal health from CRESA (Center of Research in Animal Health) in Spain validated the questionnaire.

The definition of Phytotherapy used for the survey was “the use of plant-derived products in the treatment and/or prevention of disease or as animal health promoting agents”. This overall definition derives from the scope of products and was used also in the “Report on research projects in the field of phytotherapy cooperation between research bodies and initiatives to reduce the use of antibiotics by using phytotherapeutic remedies” (Tamminen et al., 2016). This definition was shared with scientists involved and finally included in the introduction of the questionnaire in order to standardize the procedure for the interviews and reduce interpretation bias.

Before performing the interviews, two pilot testing of the questionnaire through “face to face” interviews were conducted in Spain in February 2015, with an experienced feed adviser in pig farms and with a veterinarian using phytotherapy in organic poultry farms. The aims of conducting pilot interviews were to assess the time needed to conduct the interview, to evaluate possible reactions of the respondents, and to discover possible errors in the survey. Comments and improvements were gathered from the project partners, and the questionnaire was modified accordingly.

The final structure of the questionnaire was subdivided in seven blocks, and consisted of 32 questions, of which seven were open, and 25 were closed questions (Annex 1). Two questions addressed the opinion on factors affecting efficacy, and aspects related to the decision of using phytotherapy, using elicited responses, ranked on a 5-point Likert scale. The time for the completion
of the interview was estimated to last about 35 min. The blocks of information intended to be collected were as follows:

<table>
<thead>
<tr>
<th>BLOCK NUMBER</th>
<th>BLOCK CONTENT</th>
<th>INFORMATION TO BE COLLECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PERCEPTION OF THE VETERINARIAN/FEED ADVISOR ON THE USE OF PHYTOTHERAPY</td>
<td>Trending use and reasons to use phytotherapy</td>
</tr>
<tr>
<td>2</td>
<td>SKILLS</td>
<td>Level of expertise and gained knowledge</td>
</tr>
<tr>
<td>3</td>
<td>PRODUCTS</td>
<td>Type, amount, form, and the way they use the products, along with certain factors potentially affecting their efficacy</td>
</tr>
<tr>
<td>4</td>
<td>ANAMNESIS + DIAGNOSIS</td>
<td>Routine animal health monitoring, animal health history, data looked for, and how a diagnosis is performed</td>
</tr>
<tr>
<td>5</td>
<td>TREATMENT</td>
<td>Dosage, treatment duration</td>
</tr>
<tr>
<td>6</td>
<td>SPECIFIC CASES OF DISEASE</td>
<td>Respiratory and digestive disorders</td>
</tr>
<tr>
<td>7</td>
<td>MEASURES TO EVALUATE THE OUTCOME OF THE APPLIED PRODUCT</td>
<td>Measures to check success of treatment</td>
</tr>
</tbody>
</table>

4.2 Identification of candidates

Practicing veterinarians and feed advisors in France (FR), Germany (DE), Netherlands (NL) and Spain (ES) were selected to be interviewed for task 9.4 of IMPRO. The selection of target population was initially determined on the criteria, based on the overall project requirements as follows:

- Practicing veterinarians who have experience with prescribing or recommending any phytotherapeutic remedy in order to treat or prevent disease or improve animal health conditions;
- Who work in pig and/or poultry farms;
- Who work in conventional or organic livestock systems.

Early in the project there was an agreement among partners to broaden the criteria and include feed advisers (see glossary) as targets, given their important role in recommending feed additives, and the low availability of practicing veterinarians using phytotherapy in some countries. In addition, differences in the infrastructure, availability, and use of phytotherapy in the participating countries have resulted in differences in the selection process and the final number of interviews. In brief:
**FR:** A total of 19 candidates were identified through the network in the Veterinary University of Nantes within a reasonable distance within this area. An additional group of five candidates were found through announcements on an internet site dedicated to veterinarians. After a first contact via email, they were contacted via telephone. From the 24 persons previously identified, a total of 20 took part in the interview (nine poultry veterinarians, one poultry feed advisor, nine pig veterinarians, and one pig feed advisor). The high response rate might be due to the fact that they were mostly recruited through a network and announcements, where only interested people were addressed. The number of direct interviews was 13. Seven interviews were carried by phone as this was more feasible due to the distance or availability.

**DE:** An initial search was conducted to a wide range of collectives in order to identify candidates: Veterinarians who have the additional qualification “biological veterinary medicine / phytotherapy” were identified through the database of the main association for alternative veterinary medicine in DE. Feed advisors were identified through ordinary internet search. DE also participated at the central conference in Germany about phytotherapy in food producing animals to gather further contacts. However, the efforts were of limited success. Therefore, organic pig and poultry farms were additionally contacted. The search revealed that practicing veterinarians use phytotherapy mostly in companion animals, while in food producing animals, homeopathy is preferred. Finally 21 veterinarians for food-producing animals, with the title “biological medicine or phytotherapy”, seven feed advisors were identified and invited. Contacts were via email, post, and phone, including phone reminders when needed. Of all 34 selected, only 5 took part in the interview (1 poultry veterinarian, 1 pig veterinarian, and 2 feed advisors covering both species) after email and phone contacts. The main reason for the reluctance of the addressed experts and their limited availability to be questioned can be lead back to the legal uncertainties regarding the application of phytotherapeutic products in livestock.

**NL:** Announcements were placed in the electronic newsletters of the national pig and poultry veterinary and the national feed industry organisations. These organisations together have approximately 500 members. However, only four positive responses were obtained. Because of this low initial response, 25 feed companies, board members from the animal division of the Dutch association of phytotherapy and veterinarians from the network of the Faculty of Veterinary Medicine of Utrecht were directly approached by e-mail or telephone contact. This resulted in 16 additional potential candidates. The main constraint to find candidates was a limited use of phytotherapy, especially within the pig industry.

From the 20 persons identified, a total of 15 took part in the interview. Three poultry veterinarians were excluded because they were from the same veterinary practice. The 15 interviewed candidates consisted of 5 poultry veterinarians, 5 feed advisors, and 5 pig veterinarians, located in different regions of the Netherlands. Twelve interviews were performed directly and 3 by phone.

**ES:** An initial survey was carried out to check the extend of the target population. This was done through emailing organic farmers of all species, practicing veterinarians (conventional pig and poultry), veterinarians using homeopathy in any species, pig and poultry organisations, and feed additive companies selling phytogenics. Also informal contacts were used in a congress in May, addressing feed additives, in order to establish a framework of
collaboration in which companies might provide contacts. Researchers in ES also participated in a seminar about phytotherapy in farm animals.

Difficulties to achieve the envisaged number of contact persons were due to minor use of phytotherapy in pig and poultry industry, reluctance of veterinarians to use these products, and in general a limited motivation for the lack of compensation to participate in the survey, as well as lack of specific national network or forum to find candidates. Also, confidentiality policies in the feed companies constrained the identification of candidates.

Before sending the invitation contact persons were previously contacted by email and phone as a part of the recruitment process, in order to ensure they belonged to the target population, to obtain information on how to find more candidates, and to make sure that they participate. There was a personalisation of communications/letters when possible both by email and phone. From the total number of 23 candidates identified and invited, 13 interviews were carried out (7 directly, 3 via video-meeting, 3 via telephone interviews) to 6 pig feed advisors, 1 poultry feed advisor, 3 pig veterinarians and 3 poultry veterinarians located in different regions of Spain.

Data were transcribed from the returned questionnaires to an online template of the questionnaire (Google Forms) to minimize errors during manual data entry, to make the process easier, and to allow for revisions and correction of responses. Data quality checks were carried out to ensure correct data entry in the template. After completion of data recording one excel file per all questionnaires was extracted.

4.3 Interview procedure

The timeframe to carry out the interviews was from March to July 2015. In each country, all interviews were conducted by the same assigned person, using the same methodology agreed upon through guidelines. The employed procedure was as far as possible similar in each country. The questionnaires were translated by each country from the English language into the national language. To make sure that the interviewees understood the context of the questionnaire before the interview, a brief introduction was given. The aim of the survey was refreshed, the definition of phytotherapy was explained, and the information aimed to be collected under each block was explained.

Face to face structured interviews were agreed to be conducted preferably physically, although video or teleconference was also considered as an option if the participants wanted to be interviewed this way. An appropriate infrastructure and software that enabled to see (i.e. through shared screen) visual items throughout the questionnaire facilitated the interviews. When face to face interviews were not possible, they were conducted via telephone, making sure the questionnaire was simultaneously visualised by the respondent and the interviewer.

4.4 Analysis

Finally, data sets from a total of 53 interviews were collected. From the total number, two data sets (from DE) were excluded due to not meeting the inclusion criteria, leaving a total of 51 for further analysis. Responses were then coded according to 120 variables, of which 97 were quantitative, and 23 qualitative. Variables showing very general responses or which were not related to the purpose of the survey were excluded from the analysis. Answers to open questions were transformed when possible to basic units for analysis and grouped according to relevant categories.
Data analysis was performed using SPSS Version 15.0, SPSS Inc., using descriptive analysis. Due to the low number of responders in each country, no comparison among countries was carried out.

5 Results and discussion on the use of phytotherapy in pig and poultry

5.1 Descriptive measures of the respondents

Distribution of respondents was uneven between countries (20 in FR, 3 in DE, 15 in NL and 13 in ES) suggesting heterogeneity in terms of representativeness. However, distribution according to the target species was balanced (Figure 5). A 51% of the respondents worked in pig, and 49% in poultry production (either layers, broilers or others). A substantially higher proportion of users in pigs (70% of respondents) in ES could be explained by the fact that pig industry has a significant impact in the national economy in comparison to poultry production. Both conventional and organic systems were covered in the survey, with 43.1% of respondents covering organic farming, 78.4% of them covered conventional systems, and 27.4% both. NL and FR included other systems, such as free range and the Rondeel-system (alternative housing system for layers), that summed up 19.6 % of respondents.

The number of respondents per country and role is shown in Figure 6. FR holds the highest rate of respondents (90%) who are practicing veterinarians, followed by NL (67%), while in ES and DE distribution of practicing veterinarians and feed advisors is even. Regarding the role of the respondents, it was found that in the case of DE and NL none of the feed advisors had veterinary education (i.e., agronomists), while in ES and FR all feed advisors have passed veterinary education, and consequently could rely on better knowledge regarding animal health assessment. A clear assignment of roles (farmer, feed advisor, and veterinarian) at the time of using phytotherapeutics was seen as a precondition to follow uniform procedures and to avoid overlapping of professional competences that the use of borderline products might cause.

![Figure 5. Proportion of respondents working with poultry and pigs.](image)

![Figure 6. Number of respondents by profession and per country.](image)
5.2 Perceptions on the use of phytotherapy

Costs vs. expected benefits were considered important or very important by 72.6% of respondents, followed by antimicrobial resistance (62.8%) when rating how important are certain given items at the time of deciding to recommend or prescribe phytotherapy. When comparing with conventional remedies, inefficacy was clearly identified as the main reason to use conventional remedies instead of phytotherapy by 58.8% of respondents, and eight (15.7%) respondents added disease (pathogenicity, severity, mortality) and management factors as other relevant reasons (Figure 7).

Regarding estimations on the use of phytotherapy, only 13.6% of the respondent’s clients used it on their own (without the help of another professional), among which 86.2% use commercial products, and only 13.8% use self-made products. Veterinarians and feed advisors were considered as the main professionals promoting the use of phytotherapy (43.1% and 37.3% of respondents, respectively), whereas technicians and farmers were mentioned only by 9.8% of the respondents. This confirms that veterinarians and feed advisors considered themselves as taking the key role, despite the fact that herbal products, mainly feed additives with no need of prescription, can also be purchased directly by the farmer.

![Figure 7. Reasons not to use phytotherapy and use conventional remedies instead (multiple answers were permitted).](image)

5.3 Professional skills

The next block tried to assess the level of expertise of the interviewees concerning the use of phytotherapy. Education and training are key areas of preconditions in terms of developing professional competence to use these type of products. Whereas 76.5% of respondents had more than ten years of experience in pig or poultry farms, only 42.2% of them have been prescribing/recommending phytotherapy for more than 10 years. Regarding specific education in phytotherapy it was found that none of the respondents had an additional university qualification or a master degree in botanical medicine, which highlighted the lack of initial training for professionals and confirmed that there was no generally approved specialisation for veterinary phytotherapy/herbal medicine in the European Union (Tamminen et al., 2016). In fact, knowledge on phytotherapy seemed to rely mostly on self-training, as the majority of them (60.8%) learnt by themselves through books, manuals, internet etc. Only a few (15.7%) attended specific short courses, either face-to-face (13.7%), or online (2%), being generally training courses provided by a
private company. A substantial proportion of respondents (84.3 %) did not receive any type of further training in the subject in the last 3 years.

These data indicate an insufficient availability of skilled professionals. Together with the uncertain efficacy of this type of products, this makes the effective use of phytotherapeutic products still highly dependent on experience, tradition, and information from the manufacturer, if available.

5.4 Products used

A third block addressed the type, sources, and purposes of the products used in the routine practice, and the factors that may affect their efficacy. The plant is used by 92.2% of respondents in the form of essential oils or plant extracts, while only 7.8% used it unprocessed (raw plant).

Generally products were obtained through a feed additive/pharmaceutical company (62.8% of the respondents), with only few (7.8%) making the remedy themselves. Only a total of 19.6% respondents, all from FR, made the formulation themselves, but the preparation of the raw material was done externally by a laboratory. Regarding the waiting time for availability, this type of products takes longer to be obtained in comparison with conventional ones according to 25.5% of the respondents. This might increase the risk of a considerable delay when using the products.

Results showed a wide variety of intended use for phytotherapeutic products. The most common purpose was prophylactic, particular to prevent digestive diseases (80.4%), followed by parasitic (45.1%), or respiratory diseases (43.1%). This result is in line with previous results in IMPRO (Tamminen et al., 2016), where the majority of studies surveyed showed preventive purposes. Use for treatment was less common, with 64.8% of respondents using it for digestive diseases, 49% for respiratory, and 20% for treatment of parasitic diseases such as coccidiosis in poultry. It is remarkable that 62% of the respondents included other purposes, mainly general health improvement claims, 21.6% mentioned stress/behaviour problems. Other indications included immunomodulation, urinary tract problems, growth promotion, anti-inflammatory/analgesic, antioxidant, and liver protection (Figure 8).

![Figure 8. Proportion of respondents according to different intended uses.](image-url)
The importance of factors that may affect efficacy of phytotherapeutic products was measured on a 5-point Likert scale. An appropriate diagnosis was considered important or very important by 94.1% of respondents, followed by the presence of stress factors (environmental, management, etc.), which comprised 86.3%. However, these results should be taken with caution, as beliefs about what other actors in the farm expect them to think might explain a tendency in all nine factors elicited to be considered important or very important by 75% or more of the respondents. Furthermore, hygiene (82.4%), quality assurance of product (82.4%), severity of disease (80.4%) and feed composition (74.5%) were also considered important or very important determinants of efficacy. Other factors highlighted by the respondents included aspects related to the application of the products (mode, doses), management/rearing system, and therapy loyalty (see glossary).

5.5 Anamnesis and diagnosis

Assessing causes of impaired animal health is difficult due to the manifold interactions between health influencing factors. Complexity arises with current definitions of disease that enclose subclinical conditions, health management and herd performance (LeBlanc et al., 2006).

Monitoring information linked to the animal health status

Monitoring is a fundamental precondition for early detection of diseases. It is essential to establish timely interventions on farms to prevent more or prolonged use of medication from being necessary. This is especially relevant in preventive approaches to diseases. With regular monitoring of clinical and sub-clinical signs of diseases, it is possible to focus on those farm situations which considerably deviate from the median values and to proceed with further in-depth examinations on how to reduce stressors. Furthermore, regular monitoring can help to administer the most appropriate treatment strategy to support healing and to prevent extended suffering in diseased farm animals (Keller & Sundrum, 2016).

The link between health and performance was reflected in the open question on how (measures, procedures) is the health status of the animals monitored for routine surveillance (Figure 9). Performance indicators, and feed/water intake as indirect measures of animal health were considered by nearly half of the respondents (58.8% and 51%, respectively). However, clinical symptoms were seen as most important (70.6%). Almost half (45.1%) mentioned mortality as a measure to monitor health at group level. It should be noted that eight respondents (all feed advisers) did not answer to this question, or mentioned the veterinarian as the main person responsible of this monitoring. This might be due to the fact that their area of expertise is generally more related to nutrition and growth performance. Furthermore, only few respondents (17.6%) specified who performs this monitoring, and among those who did, farmers and technicians (see glossary) who are in direct contact with animals, were considered as the main professionals performing this monitoring.
Criteria of housing conditions were considered by only 7.8% of respondents. This may reflect that a full assessment of the farm system at the time of monitoring is not always performed, given the importance of the impact of environment conditions in poultry and swine health and on their natural disease resistance.

Availability of records is important as they help to identify health issues, but they can also be used to help pinpoint a problem and assess whether an intervention strategy towards production diseases has been successful. According to the respondents, records that reflect this monitoring of health (which would include production records) were present in average on 80% of their farms, not present in 16.1%, and unknown in an average of 3% of farms. A percentage of 5.9% of the interviewees did not answer to this question. These results showed a relatively high availability of records in the farms of the respondent’s clients surveyed providing the ground for a potential use of these data. It was observed that FR holds the highest availability of records, followed by DE, NL and ES.

Regularly performed monitoring is also important for the same reasons mentioned above. Frequency of visits was addressed by asking how many times per year did they visit each farm to supervise the animal health status. Results showed a high variability due to the many farm factors that may affect this frequency such as specific farm needs that vary during the year. Consequently, some respondents found it difficult to provide averages and used ranges instead. More than half of respondents (64.6%) performed less than one farm visit in average per month, and 39.6% less than two per year. Seven (13.7%) respondents, all feed advisers, did not answered the question or answered “0” visits. Only 35.4% visited the farm more than once a month, being most of them practicing veterinarians (70.6%). The average number of visits that veterinarians performed was 9 (9 ± 11.4) per year, slightly higher than for feed advisers (7 ± 7.5). This indicates that veterinarians tended to visit farms more frequently than feed advisers.

**Anamnesis**

Multiple sources of information as well as completeness and reliability of information might lead to a more profound anamnesis. Therefore, members of the target group were asked where background information about diseased animals was obtained from. The most used source of information was the combination of farmer’s reporting of the case and farm health records in the form of paper/files (40%) (Figure 10). Few respondents (27.4%) used only one source: case reporting by farmers (23.5%), health papers or files (3.9%), or farm management software (2%), whereas a total of...
62.7% interviewed used a combination of sources. All feed advisers did not answer to this question, probably because they might have considered veterinarians as the only appropriate respondents. The problematic of completeness of information become obvious by the fact that nearly a quarter of the respondents obtained their information solely from farmer’s reporting. This information source is at high risk to lead to under-reporting of health data (Jansson Mörk, 2009).

Obtaining a comprehensive picture of the disorder and symptoms as well as of the multiple environmental factors is a precondition for a successful achievement of treatment goals. Thus, the interviewees were asked about the most relevant information they looked for in case of digestive and respiratory diseases. Environmental parameters were very few mentioned (3.9%), while the most relevant information for them were feed intake, mentioned by 70.6% of respondents, mortality (68.6%), clinical (66.7%), and performance data (66.7%), followed by vaccination plans (64.7%) and previous treatments (56.9%). More than half (52.9%) of respondents indicated that they take into account epidemiological measurements (i.e. incidence or prevalence of disease), whereas laboratory and post-mortem results were scarcely mentioned (35.4% and 27.4% respectively). Again, 7.9% of the interviewed (all feed advisers) did not answer to this question.

This result highlighted that an anamnesis is performed mostly by using clinical and/or performance parameters. However, a comprehensive assessment of the living conditions of the farm animals was not always performed. Housing/environment and hygiene conditions were generally not considered by the respondents.

**Diagnosis**

Profound diagnosis is not restricted to the perception and identification of symptoms of diseases. It should also enclose the identification of pathogens as well as the animal’s susceptibility to infections, influenced to a high degree by the hygiene management and the feeding regime (Sundrum, 2010). A comprehensive diagnostic procedure would increase the chance to identify the most appropriate counteractive measures. However, these aspects were not mentioned by most of
respondents in the open question on the description of resources used for diagnosis of digestive and respiratory diseases (Figure 11). This might be due to the fact that diagnostic procedures (serology, microbiology, necropsy etc.) aiming to obtain clinical measures were named to respondents as default examples to answer this open question.

Only 5.9% of respondents mentioned antibiogram or phytogram/aromatogram (see glossary) as resources that measure treatment sensitivity. The remaining answers deal with resources aiming to collect clinical measures: a 78.8% answered serology/blood samples, 74.5% culture, 70.6% necropsy, and 41.2% PCR. A total of 13.7% of respondents did not answer this question and few (3.9%) considered no resources were necessary or had no resources available.

![Figure 11. Percentage of responses per type of resource.](image)

Regarding the question what triggers the use of phytotherapy, 41.2% of the respondents considered aspects related to the severity or stage of disease (prophylactic use, early suspicion of disease, mild problems, and low mortality) as clearly the most relevant information to decide whether phytotherapy is an option in the case of respiratory/digestive disease. This revealed a tendency to use it preferably for prevention purposes. Other responses were related to clinical history/symptoms (13.7%), aetiology (9.8%), management (5.9%), withdrawal periods preventing the use of antibiotics (5.9%), or high level use of antibiotics (5.9%). Few (9.8%) specified phytotherapy as their first option, and other 9.8% (all feed advisors) did not answer the question.

### 5.6 Treatment

**Treatment records**

Records regarding the administered treatments are essential not only because it is a legal requirement in the case of veterinary medicines. They are also essential to monitor and therewith assess the effectiveness of treatments. The legal requirement of recording is not applicable to feed additives, but still recommendable, and a precondition for monitoring and quantify success in relation to the expected outcome.
Regarding what sort of information about the plant derived product is available in the treatment plan (defined as register/book where date and details of the treatments are recorded), data about herd response to treatments, the products used compiling dose, and frequency were recorded according to the replies of approximately half of the respondents (49% to 58%, depending on the information source to record) (Table 6). A total of 27.5% to 37.3% did not record these data, and seven respondents (13.7%) did not know if these data were recorded. These results show poor data availability and poor preconditions to measure efficacy at the time of using this type of products. According to 49% of the respondents, data recording was performed by the farmer, directly by the veterinarian (31.4%), or by both (2%). In the case of data recording by the farmer, it was unclear whether this was supervised or not by a veterinarian.

Table 6. General potential registers and current records available about the plant derived product in the treatment plan of the farms where the respondents are working

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herd response after use</td>
<td>25 (49%)</td>
<td>19 (37.3%)</td>
<td>7 (13.7%)</td>
</tr>
<tr>
<td>Product used</td>
<td>30 (58.8%)</td>
<td>14 (27.5%)</td>
<td>7 (13.7%)</td>
</tr>
<tr>
<td>Dose</td>
<td>29 (56.9%)</td>
<td>15 (29.4%)</td>
<td>7 (13.7%)</td>
</tr>
<tr>
<td>Frequency</td>
<td>28 (54.9%)</td>
<td>16 (31.4%)</td>
<td>7 (13.7%)</td>
</tr>
<tr>
<td>Date of application /length of treatment</td>
<td>29 (56.9%)</td>
<td>15 (29.4%)</td>
<td>7 (13.7%)</td>
</tr>
</tbody>
</table>

**Dosage**

A further question dealt with the optimum dosage, asking how the interviewees ensure that each animal receives the selected dose. Many studies have reported a dose-response relationship and have stressed the importance of using an appropriate dose. Some of the authors noticed an increase in the intended effect when the dose of the supplement was increased (Christaki et al., 2004; Lee et al., 2008). However, others such as Engberg et al. (2012) and McDougald et al. (2014) noted a dose related decrease in body weight when feeding high doses of a botanical extract. This highlights the importance of not applying an overdose either, as adverse health effects cannot be excluded in the case of an accidental overdose (Windisch et al., 2008).

It was found that 3.9% of respondents did not take treatment dosage into account. The majority of respondents (82.4%) used expected water or feed consumption/kg live weight as means of control dosage, followed by homogeneous distribution in feed/water (51%) (Figure 12). However, expected water or feed consumption is highly variable and thus might be imprecise. It has been previously associated with imprecise drug intake, leading to under- or over-administration of drugs (Hall, 2000; Toutain et al., 2010). Together with a general lack in the control and information of the ingredients in
remedies used (Tamminen et al., 2016), this makes an appropriate dosage difficult or even impossible to achieve.

Less than half of the respondents (41.2%) considered to strictly follow the labelling/product instructions. Individualised feed/water management, which would be the best resource to ensure that each animal receives the chosen dose, was selected by only 3.9% of the respondents.

![Graph showing percentage of responses per item.](image)

**Figure 12. How the respondents ensure each animal receives the selected dose.**

### Length of treatment

The next question addressed how long the chosen products were administered in average when used for digestive and respiratory diseases. The wide range of time periods used within each category showed a great variability (Table 7). Higher time periods were used in the case of prevention of both respiratory (8 ± 7 days) and digestive diseases (8.6 ± 7.6 days) compared to time periods in the case of treatments (6.2 days ± 5.1, and 15.5 days ± 13.1, respectively). These figures do not include outlier values (five respondents answered over 100 days, continuous administration, or lifetime as length for prevention of digestive disease numbers).

<table>
<thead>
<tr>
<th></th>
<th>Number of respondents</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>prevention</strong></td>
<td>19</td>
<td>2 days</td>
<td>28 days</td>
<td>7.97 days</td>
<td>6.96</td>
</tr>
<tr>
<td><strong>Respiratory disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>treatment</strong></td>
<td>21</td>
<td>3 days</td>
<td>25 days</td>
<td>6.23 days</td>
<td>5.11</td>
</tr>
<tr>
<td><strong>Digestive disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>prevention</strong></td>
<td>36</td>
<td>2 days</td>
<td>45 days</td>
<td>15.6 days</td>
<td>13.1</td>
</tr>
<tr>
<td><strong>Digestive disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>treatment</strong></td>
<td>21</td>
<td>3 days</td>
<td>25 days</td>
<td>6.23 days</td>
<td>5.11</td>
</tr>
</tbody>
</table>
5.7 Specific cases of disease (respiratory and digestive disease)

Situations and stages of the production cycle

In a farm animal's life cycle, certain periods are more stressful than others. Stressful events might increase susceptibility of the animals to diseases. Appropriate measures, including the use of phytotherapy, could support the animals to cope with these challenges. Therefore, the interviewees were asked in which specific situations or life stages they prescribe/recommend phytotherapy to prevent or treat respiratory or digestive disorders. A high heterogeneity was found in the answers for this open question, revealing again a not standardised use of these products (Figures 13, 14, 15, and 16).

In pigs, for respiratory diseases, fattening (7 responses) was considered the main stage followed by piglets (pre-weaning, weaning, or post-weaning) with 3 responses (Figure 13). In this open question also 3 responses considered use of phytotherapeutic products for viral diseases, as antibiotics are not appropriate. Similarly, products were used as an alternative before slaughter for one respondent due to the withdrawal period associated with the use of an antibiotic. A total of three responses did not specify a stage, and mentioned critical periods at any stage of production. In the case of digestive disease, half of responses mention piglets (pre-weaning, weaning, or post-weaning) as the main stage to use phytotherapy (Figure 14), followed by fattening, with five responses, and "sow" with only two. A total of five did not specify a stage in particular, mentioning it can be used in any stage of production.

In poultry production, responses in the case of respiratory diseases were also heterogeneous and provided no focus on a particular stage of production. However, respondents mentioned specific risk periods where animal health is challenged like increase stocking density, early symptoms of diseases, change from indoors to outdoors, or post-vaccination (11 responses) (Figure 15). In the case of digestive diseases, most respondents (9) mentioned the use of phytotherapy as useful in any stage (Figure 16). A total of six respondents mentioned the use of phytotherapeutic products in the case of environmental challenges (housing, density, or changes in temperature) or feed change, whereas other respondents mentioned coccidiosis, and in general "young animals".
Mode of use

In general, phytotherapeutic remedies can be used alone or combined with conventional treatments (i.e. antibiotics) or with other alternative remedies (organic acids / prebiotics). Their use combined with conventional treatments might support their effect and reduce resistance (Rather, 2013), thus allowing reduction of conventional medication and treatment costs. To gain an overview with respect to the mode of use, participants in the survey were asked how often they combine phytotherapeutic remedies with other conventional or alternative treatments in the case of digestive/respiratory disorders.

It was found that phytotherapy is often used in combination with other remedies. Among the nearly half of the participants (54%), who used them for respiratory disease, less than half of them (42.8%) used “phytotherapy only”, while the 57.1% remaining used it at least sometimes in combination, mostly with conventional treatments (Figure 17). A similar picture was found for digestive diseases (Figure 18), where 39.6% used “phytotherapy only”, while the remaining 60.4% used phytotherapeutic products in combination, again mostly with conventional treatments. This adds complexity at the time of assessing success of individual phytotherapeutic products at farm level, as it would be difficult to establish a cause-effect relationship between a single product and the outcome.
5.8 Monitoring of success

There is a lack of data regarding the preventive effects and impacts of phytotherapeutic products on prevalence and incidence of production diseases. Implementation of monitoring concepts is an essential precondition to assess the effects of both conventional remedies and phytotherapy under field conditions, as well as to identify good husbandry practices and prevention programs that encourage strong resistance to diseases (Doehring et al. 2016).

In total 92.2% of respondents affirmed that an assessment of the outcome was performed after using the product. However, they provided scarce information on the methods of monitoring for digestive and respiratory diseases. The results revealed a combination of clinical/observation measures (74.5%) and progress of performance parameters (68.6%), whereas 17.6% specified that the feedback came about from the level of satisfaction of the farmer. Only 15.7% of the respondents mentioned the use of complementary/laboratory tests as a source of feedback.

This result reflects that a certain level of assessment might be performed, but a substantial part of the information gathered was experience based (relying on farmers’ impressions) or based on indirect animal health measures (performance). Information about procedures, resources and recording of the monitoring was not collected in a standardised format. Therefore, the situation is quite confusing. Phytotherapeutic products might be considered in combination with conventional medicines. However, conclusions deriving from monitoring records of individual treatments addressed separately might be unreliable. The outcome might not be clearly associated with a concrete measure which would allow to assess the impacts of making use of phytotherapeutic products because the major use is to prevent disease and health claims are often unspecific.

After an applied remedy turns out to be unsuccessful in improving the prospect of success it is a precondition not only to consider changes of the treatment but also to consider risk factors of the disease. Some respondents (25.5%) would only review the implemented treatment plan. The majority (68.6%) would combine this review of treatment plan with reducing risk factors of disease by changes in the biosecurity plan, environmental conditions, and/or feed regime. A 5.9% of interviewees (all feed advisors) did not answer to this question (Figure 20).
Among those, (25.5%) who only review the treatment plan after unsuccessful treatment, 55.5% indicated that they would change to a conventional treatment, 26.7% would change the regime (doses/frequency and/or duration), and 17.7% would change to another plant derived product (Figure 19).

Relevance of risk factors was specified by only 25.5% of respondents. A combination of all aspects (biosecurity, environment, feed regime) was the most mentioned (38.5%) answer within this group, followed by feeding regime (15.4%). Seven respondents (13.7%) highlighted that reducing risk factors of diseases were considered systematically before treatment failure.

![Figure 19. Procedure in case the remedy is not successful after application.](image1)

![Figure 20. Procedure in case the treatment plan (TP) is reviewed.](image2)

### 6 Conclusion

The current use of herbal medicinal remedies is on a low level in food producing animals. They are mostly marketed as feed additives. However, this category is lacking any transparency, especially with regard to the quality criteria for their production and the proof of efficacy when used in farm practice.

In this complex situation, identifying optimal preconditions that enable effective use of phytotherapy remains a challenge, especially when considering that phytotherapy is sometimes used in healthy animals with unspecific health claims and with no uniform courses of symptoms. The variety of professional roles and modes of use of phytotherapeutic products makes a systematic approach to assess the relevance of these products only approximate. Nevertheless, it can be concluded that some of the essential preconditions are not fully met.

Results showed that professional skills might be insufficient, as even those who have used phytotherapeutic products for longer time periods had little or no formal education on this matter. Due to the reason of possible risks for animal health and welfare, only skilled professionals should make use of phytotherapy. The multifactorial nature of production diseases is often not considered appropriately. Furthermore, a profound anamnesis and diagnosis was not always performed, which is not surprising considering the use of these products often took place under the responsibility of the farmer and/or feed adviser without a veterinary supervision. Plant compounds were generally used as essential oils while length of administration and indications were quite heterogeneous.
Treatment data were seldom recorded. In the case of recording, the data might be unreliable, particularly when phytotherapeutic products were used in combination with other remedies, and when the health claims were unspecific. Possible interactions with other remedies and preventive measures make it nearly impossible to assess the impacts of phytotherapeutic products. Thus, their use is based more on believes in their effectiveness than based on any evidence.

The current regulatory constraints led to a non-standardised use of herbal products. Generally, they are marketed with no evidence of efficacy. The lack of skilled professionals and the limitations to assess the effectiveness on the farm level contradict with the expectations to consider phytotherapeutic products as an alternative to the use of antibiotics.

It was found that inefficacy is the main concern for the respondents at the time of using phytotherapy. However, even if scientists and manufacturers might develop effective products, these are unlikely to be a substitute for good management practices. Thus, to improve the prospects of using botanical products in the most effective way as alternative to sub-therapeutic use of antibiotics, farm-centric health plans that capture the farm complexity are required, along with increased cooperation between feed advisor, practice veterinarian and farmer at the time of using phytotherapy. In acute and severe cases of diseases, the consultation of a veterinarian remains essential to prevent extended suffering of farm animals. A more structured collection of data on the use of phytotherapy in farm practice is necessary for shedding more light on possible approaches and barriers for their use in the future. Under the current legal and on-farm conditions, the use of herbal remedies is hardly relevant as an option for reducing the use of antibiotics.
7 Glossary

- **Antroposophy**: A formal educational, therapeutic, and creative system established by Rudolf Steiner, seeking to use mainly natural means to optimize physical and mental health and well-being.

- **Aromatogram/phytogram**: Alternatively to the antibiotic susceptibility testing (antibiogram), this analytical technique shows the antibacterial/antifungal activity of essential oils against specific strains.

- **Essential oil (EO)**: also called volatile or ethereal oils- are aromatic oily liquids obtained from plant material (flowers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits, and roots). EOs are complex mixtures of secondary plant metabolites consisting of low-boiling-phenylpropenes and terpenes. They are typically extracted by distillation methods, in particular steam distillation. Apart from their traditional use (flavours, fragrances) potential effects on health due to their antimicrobial activity, and on growth promotion have been suggested.

- **Feed additive (FA)**: Feed additives are products used in animal nutrition for purposes of improving the quality of feed and the quality of food from animal origin, or to improve the animals' performance and health, e.g. providing enhanced digestibility of the feed materials. Feed additives may not be put on the market unless authorization has been given following a scientific evaluation demonstrating that the additive has no harmful effects, on human and animal health and on the environment (2011/25/EU).

- **Feed advisors**: Professionals that provide feeding advice to producers of cattle, sheep, pig or poultry, sometimes including advice on the use of feed additives for health management. These advisers might be nutritionists working for feed companies, or independent advisers employed on a consultancy basis by farm businesses.

- **Feed material**: Product of vegetable or animal origin, whose principal purpose is to meet animals nutritional needs, in their natural state, fresh or preserved, and products derived from the industrial processing thereof, and organic or inorganic substances, whether or not containing feed additives, which are intended for use in oral animal-feeding either directly as such, or after processing, or in the preparation of compound feed, or as a carrier in premixes”. (2011/25/EU).

- **Feed ingredient**: A component part or constituent of any combination or mixture making up a commercial feed.

- **Herbal medicinal product**: any medicinal product, exclusively containing as active ingredients one or more herbal substances or one or more herbal preparations, or one or more such herbal substances in combination with one or more such herbal preparations (Directive 2001/83/EC).

- **Herbal substances**: All mainly whole, fragmented or cut plants, plant parts, algae, fungi, lichen in an unprocessed, usually dried, form, but sometimes fresh. Certain exudates that have not been subjected to a specific treatment are also considered to be herbal substances. Herbal substances are precisely defined by the plant part used and the botanical name according to the binomial system (genus, species, variety and author). (Directive 2001/83/EC).

- **Phytogenic feed additives (PFA)**: Plant derived substances or preparations, which are intentionally used in animal nutrition for purposes of improving the quality of feed and the quality of food from animal origin, or to improve the animals' performance and health.

- **Technician**: Person that carries out a mixture of manual work and animal husbandry in a farm setting, who provides hands-on technical support to the farm, and undertakes the daily care routine for animals.
• **Therapy loyalty**: The extent to which the conduct of a person corresponds to the recommendations given by a care provider.

• **Withdrawal period**: Time required after administration of a drug to a food-producing animals needed to assure that the pharmaceutical residues in food (meat, milk, and eggs) is below a determined maximum residue limit (MRL).

8 Acknowledgments

We want to thank many people for their contributions. To all people who was interviewed in France, Germany, Netherlands and Spain for their time, patience. Specially to Antonio Palomo for his expertise and availability. To Alexandre Udina from Adial S.L, and Sigfrid López from Pancosma S.L, for their unvaluable collaboration in Spain. Isabel Blanco for her help with and beyond the task, Toni Velarde and Emma Fábrega for their support and guidance. Also many thanks to Inske de Vries who conducted the interviews in the Netherlands.
9 References


Commission implementing Regulation (EU) No 230/2013 of 14 March 2013 on the withdrawal from the market of certain feed additives belonging to the group of flavouring and appetising substances.


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Tamminen, L.-M., Blanco Penedo, I., Fernandez Gonzalez, C., Sundrum, A. 2016. Report on research projects in the field of phytotherapy cooperation between research bodies and initiatives to reduce the use of antibiotics by using phytotherapeutic remedies. IMPRO Project Number: 311824.


Annex 1: Questionnaire for veterinarians who have used phytotherapy

INTERVIEW TO PIG AND POULTRY VETERINARIANS WHO HAVE USED PHYTOHERAPY

Purpose of the survey

The main goal of this survey is to gain an overview of the context and the surrounding conditions in which phytotherapy is used in poultry and pig farming practice in different European Countries. Furthermore, the diagnostic and therapeutic procedure used by the veterinarians in farm practices will be assessed with a focus on respiratory and digestive infectious diseases, along with their skills in phytotherapy and practical use of the products according to their practical experience.

Structure for the survey

To cover this objective, a global structure of the questionnaire is as indicated below. The veterinarians/feed advisors are divided in those experienced in the use of phytotherapy in swine or in poultry production.

Structure:

- **BLOCK 1:** PERCEPTION OF THE VETERINARIAN/FEED ADVISOR ON THE USE OF PHYTOHERAPY: Trends in use and reasons to use phytotherapy

- **BLOCK 2:** SKILLS: Captures the level of expertise and how he/she gained it.

- **BLOCK 3:** PRODUCTS: Type, amount, form, and the way they use the products, along with certain factors potentially affecting their efficacy

- **BLOCK 4:** ANAMNESIS + DIAGNOSIS: This block deals with routine animal health monitoring, where is animal health history information obtained from, what data are looked for and how (procedure and resources) a diagnosis is performed

- **BLOCK 5:** TREATMENT, dosage, frequency, application form,...

- **BLOCK 6:** SPECIFIC CASES OF DISEASE (Respiratory and digestive disorders)

- **BLOCK 7:** MEASURES TO evaluate the outcome of the applied product
QUESTIONNAIRE FOR VETERINARIANS WHO HAVE USED PHYTOTHERAPY

Questionnaire Code: _____

Interviewed:

- Veterinarian practitioner
- Feed advisor:   - Veterinarian
- Non veterinarian

Experienced in the use of phytotherapy in:
- PIG
- POULTRY:   - Broilers
- Ducks
- Others:

Production system:
- Organic
- Conventional
- Others (Label, SPF...): __________

Date:

Interviewer:

Introduction: The aim of this questionnaire is to gather information about the context and the surrounding conditions in which phytotherapy is used in pig and poultry farming practice, specifically for the most important diseases where high amounts of antibiotics are used (digestive and respiratory diseases) in order to be able to elucidate the efficacy of plant derived products.

In this survey we would like to assess your perception and practical experience in the use and farm health management regarding the use of plant derived products. It will take approximately 30 to 40 minutes.

During the process, please note the concept of Phytotherapy will be considered as the use of any plant derived product for the treatment, prevention of diseases or to promote animal health.

BLOCK 1: PERCEPTION ON THE USE OF PHYTOTHERAPY: Trending use and reasons to use phytotherapy

1. How important are you each of the following items at the time of deciding to recommend/prescribe phytotherapy?
   (There is no maximum no. of checkmarks per column)

<table>
<thead>
<tr>
<th></th>
<th>Very important</th>
<th>Important</th>
<th>Neither important nor unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinion of the farmer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs vs. Expected benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimicrobial resistance</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Potential toxicity from the plant derived product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 2 of 12
2. **What are the most frequent reasons for you NOT to prescribe/recommend phytotherapy in the treatment/prophylaxis of respiratory or digestive disorders, and use conventional treatments (e.g. antibiotics) instead?**
   (Multiple answer possible)
   - [ ] Cost versus benefits
   - [ ] Preferences of the farmer
   - [ ] Past unsatisfactory experiences with efficacy of Phytotherapeutics
   - [ ] Difficulties with application in the flock/herd
   - [ ] Other: __________________________

3. **Could you provide an estimate of the percentage of farmers among your clients that make use of phytotherapy by themselves?**
   (Note: If "yes": ask for what type of products. Multiple answers are possible.)

   _____% Yes → Type of products farmers use: [ ] Own preparations / raw plant
   [ ] Commercial products

   _____% No

   _____% Unknown

4. **Who is, according to your experience, the main professional promoting the use of phytotherapy?**

   [ ] Feed advisors/nutritionists
   [ ] Technicians
   [ ] Farmers
   [ ] Veterinarians
5. How long have you been practicing/advising in poultry/pig farms? _______ years
   (Tick according to the answer given. These options are for codification only, not to inform the interviewed)
   - Less than a year
   - 1-5 years
   - 6-10 years
   - More than 10 years

6. For how long have you been prescribing/recommending on phytotherapy?
   _______ years
   (Tick according to the answer given. These options are for codification only, not to inform the interviewed)
   - Less than a year
   - 1-5 years
   - 6-10 years
   - More than 10 years

7. Do you have specific training in the area of phytotherapy?
   - Yes
   - No specific education / Just doing → Go to next section Q 10

8. In what type and duration of training did you initially gain your phytotherapy knowledge?
   - Self-education (e.g. with books, internet, etc.)

<table>
<thead>
<tr>
<th></th>
<th>1-2 days</th>
<th>2 days-1 week</th>
<th>1 week-1 month</th>
<th>More than a month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online training course</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presental course</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masters degree in.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
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<tr>
<td>Additional university qualifications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
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</tbody>
</table>
9. How many further training courses on phytotherapy (with a duration of 1 day or more) have you attended in the last 3 years? 

☐ None in the last 3 years
☐ 1-3 courses
☐ 4-5 courses
☐ More than 5 courses

BLOCK 3: PRODUCTS

Explain this section deals with the type, amount, form, and the way they use the products, along with certain factors potentially affecting their efficacy.

10. What are the most frequent purpose/s (specify if it is for treatment, prophylaxis or both when applicable) at the time you recommend/prescribe phytotherapy? – Rank each horizontal item independently according to their frequency of use on a scale of 1 to 3 (1=frequently, 2=sometimes 3-rarely. Leave blank when no use for that purpose)

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Treatment</th>
<th>Prophylaxis</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory disorders</td>
<td></td>
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<td></td>
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<tr>
<td>Digestive disorders</td>
<td></td>
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<tr>
<td>Parasitic disease</td>
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</tr>
<tr>
<td>Others</td>
<td></td>
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</tbody>
</table>

11. Explain in what form, generally, the plant is present in the products you use (raw plant, herbal mother tincture, herbal extract, infusion, essential oil)

__________________________________________________________________________

__________________________________________________________________________

12. When administering/recommending products, do you take into account potential interactions – synergies, antagonism – :

- with feed?: Yes/No
- with other remedies/treatments used? Yes/No
- with water quality? Yes/No
13. According to your experience, indicate the importance of each of the following factors for the efficacy of phytotherapy.
(There is no maximum no. of checkmarks per column)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Very important</th>
<th>Important</th>
<th>Neither important nor unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed composition</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Quality assurance of the product</td>
<td></td>
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<tr>
<td>The way the product is processed into feed (extrusion, pelleting etc)</td>
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<td></td>
</tr>
<tr>
<td>Stage of production/age of the animal</td>
<td></td>
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</tr>
<tr>
<td>Severity of the disease</td>
<td></td>
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<tr>
<td>Course of disease (chronic – acute)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Presence of stressors (environmental, handling, etc)</td>
<td></td>
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<tr>
<td>Profound diagnosis</td>
<td></td>
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<tr>
<td>Hygienic environmental condition</td>
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<tr>
<td>Others</td>
<td></td>
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</table>

Availability:

14. Where do you mostly obtain the products from?

☐ Self made
☐ Pharmacy/Herbalist shop/Farm dispensary
☐ Feed additive company
☐ Feed company (premix)
☐ Other ________________

15. Does it take longer for you to get to the farmer a plant derived product comparing with a conventional product?
   Yes / No
**BLOCK 4: ANAMNESIS + DIAGNOSIS:** Explain this block deals with animal health monitoring, where is animal health history information obtained from, what data are looked for and how (procedure and resources) a diagnosis is performed.

**Health status routine monitoring**

16. In what way (measures taken and procedure followed) is the health of the animals monitored for routine surveillance?
   (Keywords: clinical symptoms, feed intake, mortality, performance parameters...)

16.1 In what percentage of the farms you visit are there records that reflect this routine monitoring of health status?

   ___ % Yes
   ___ % No
   ___ % Unknown

17. How many times per year do you visit each farm in average to supervise animal health?

   ___ times/year

**Anamnesis and diagnosis (a disease is suspected)**

18. From where do you obtain the historical data about the diseased animals?

   [Multiple answer possible]

   - [ ] No information exists
   - [ ] From farmer’s reporting of the case
   - [ ] From health papers/files (e.g., paper files or Excel etc.)
   - [ ] From farm management software
19. What information do you look for in the historical health data in the case of digestive and respiratory diseases?

_____________________________________________________________________

_____________________________________________________________________

Keywords: No records available, Performance parameters, Feed intake, Occurrence of disease, Mortality/Lethality, Necropsy, Mixed origins of animals, Vaccination plans; Previous treatments (conventional or alternative); Clinical History; Abattoir surveillance data, Culture results; Serological testing results.

20. Describe what resources (serology/blood parameters / PCR examinations / necropsy/etc.) you use for a diagnosis of digestive and respiratory disease

_____________________________________________________________________

_____________________________________________________________________

21. On the basis of which information from the anamnesis and diagnostics do you decide whether phytotherapy is an option in the case of respiratory/digestive disease?

Keywords: History of diseases, procedure, symptoms they look for, type of resources used

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

BLOCK 5: TREATMENT, dosage, frequency, application form.

22. What sort of information about the plant derived product is available in the treatment plan** at your farms?

(***Definition: Register/Book where date and details of the treatments are recorded)

<table>
<thead>
<tr>
<th>Herd response to treatment</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixing instructions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
23. Who maintains / fill this treatment plan?
(Multiple answer possible)
- Vat
- Farmer
- Other ______

24. How do you ensure each animal receives the selected dose?
(Multiple answer possible)
- Not taken into consideration
- Expected water or feed consumption/kg live weight
- Homogeneous distribution in feed/water
- Strict following of labelling/product instructions
- Individualized feed/water management

25. For how long do you, in average, administer the chosen product?
(Leave blank if no use for that purpose)

<table>
<thead>
<tr>
<th></th>
<th>For treatment</th>
<th>For prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory disease</td>
<td>days</td>
<td>days</td>
</tr>
<tr>
<td>Digestive disease</td>
<td>days</td>
<td>days</td>
</tr>
</tbody>
</table>
BLOCK 6: SPECIFIC CASES OF DISEASE (RESPIRATORY AND DIGESTIVE DISORDERS):

26. What percentage of your farms participates in a herd health prevention programme and for which respiratory/digestive diseases?

_____% Disease/s: _______________________________

27. How is the routine monitoring for prevention of respiratory/digestive disease performed?
(Multiple answers possible)

<table>
<thead>
<tr>
<th></th>
<th>Clinical monitoring</th>
<th>Laboratory test (PCR, ELISA, etc)</th>
<th>Post-mortem examination</th>
<th>Historical health records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digestive disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: __________________________________________________________

________________________________________________________________

28. In which situations or stages of the production cycle do you prescribe/recommend plant derived products to prevent or treat respiratory or digestive disorders?

Respiratory disorders
________________________________________________________________

________________________________________________________________

Digestive disorders
________________________________________________________________

________________________________________________________________

29. In what percentage of times do you combine phyotherapy remedies with other conventional or alternative treatments, in the case of digestive/respiratory disorders?
(Leave blank ____% if not applicable)

<table>
<thead>
<tr>
<th></th>
<th>Only phyotherapy</th>
<th>Combined with conventional treatment (i.e. antibiotics)</th>
<th>Combined with other alternative treatments (organic acids/ prebiotics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digestive disease</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
33. When the outcome is not successful and treatment plan is reviewed, what do you usually change?

☐ Keep the same product and change the dose, frequency, and/or length
☐ Change to a different plant derived product
☐ Change to a conventional treatment

THANK YOU VERY MUCH FOR YOUR COLLABORATION

FURTHER COMMENTS:

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________