

Noise from Livestock Husbandry - Introducing a new Basis for Assessment

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Summary

In former times farms have hardly been noticed as potential sources of sound and noise. However, in the last few years this situation has changed significantly. To support noise experts in this special field the Agricultural Research and Education Centre Raumberg-Gumpenstein (AREC) developed an agricultural sound assessment guide. The Manual of Sound Technology in Agriculture focuses on the assessment of noise on existing farms and the provision of data for the planning of new farm buildings particularly in connection with livestock husbandry. All important sources of noise, agricultural traffic, rural technical equipment and vocalization of animals, were included. Especially noise emissions originating from livestock had to be considered. On the one hand animals are sources of emissions which follow biological rhythms, on the other hand the motivation to produce sound is strongly influenced by external factors, e. g. by the management. The knowledge about these facts is at least necessary to assess animal sound emissions and was included in the manual. The manual was developed in cooperation with the Forum Schall and the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management. It was published in spring of 2013 via the homepage of the Austrian Federal Environment Agency.

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1. Introduction

Farms in Austria are increasingly focused as potential sources of sound and noise. Not only livestock husbandry is involved but also technical equipment and traffic related to agriculture. One of the main objectives of this project was – besides collecting sound emission data related to agricultural traffic and rural technical equipment – to generate noise emission data from livestock husbandry.

The entirety of collected acoustical data and knowledge form the basis of the *Textbook of Sound Technology in Agriculture*. In cooperation with the Forum Schall this manual for the assessment of farm noise was compiled. It represents a solid and wide base for acoustical assessments on farms. The manual was published in spring 2013 and can be obtained from the homepage of the Austrian Federal Environment Agency [1].

With reference to the introduced manual this paper gives only a brief overview. We kindly invite you to download the whole publication from the above

mentioned homepage to get your own impression of this new assessment basis.

2. Farming and Noise

There are several reasons why emissions from livestock farming have been put into the focus of public discussion. A trend to mechanization cannot only be observed in the industrial sector but also in agriculture. The more machinery (rural technical equipment, agricultural traffic) is used in everyday business the higher the potential of noise emissions. Combined with higher mechanization levels also a tendency to larger farms can be recognised. Nowadays farmers are often forced to invest in bigger stables and farm buildings to possibly keep a larger number of animals for economic reasons. Large animal housings are potentially accompanied by a higher level of vocalisations.

Some Austrian province governments introduced laws and regulations which prescribe the need of noise expert assessments during agricultural building approval proceedings. Furthermore conflicts in land use designation play a certain role within the increasing focus on agricultural noise emissions.

Last but not least rising sensitization within the population may also contribute to the recent problems with farm noise emissions.

3. Situation up to Now

Until fairly recently only inadequate emission data from livestock were available. The few publications issued mainly focus on agricultural workplace safety [2], [3], [4]. Therefore the benefit of the provided data for noise emission modelling is limited. As a consequence the accuracy of calculated farm-noise-immissions had a considerable potential to be wrong – with possible adverse consequences either for the neighbourhood or the farm owner. Furthermore special characteristics of sound emissions from livestock husbandry (e.g. variable emission patterns) were not included in the approach to account for emissions. It is obvious that these facts contributed to inconsistent farm noise assessments in the past.

4. Main Goals

Besides the aims to generate noise emission data from tractors, yard loaders (Table I) and rural technical equipment (Table II) one of the main concerns in the project was to capture sound emission data from farm animals as Cattles, Pigs, Chicken, Turkeys, Geese, Horses, Sheeps and Goats (Table III) . Furthermore these animal specific emission data had to be combined with ethological aspects of animal vocalisation. As a result assessment approaches with weighted emissions could be created.

The combination of these parameters ensured the development of a textbook for noise experts. It forms the basis for reliable immission-prognoses and contributes to better standardization and higher reproducibility in farm noise assessments.

5. Table of Content

The following main issues are treated by the *Textbook of Sound Technology in Agriculture*:

- Emission approaches for Agricultural traffic, Rural technical equipment and Animal husbandry
- Background informations to Room acoustics
- Determination of sound pressure level in stables

- Noise emissions of outer components and openings
- Ventilation systems in Agriculture
- Animal vocalization under ethological viewpoints

Table I. Model, rated power and sound immission of covered agricultural vehicles (sorted by rated power)

	Tested device	Model	Rated power	Sound immission according to car registration document
1	Yard loader	2006	25 kW	-
2	Tractor	1976	29 kW	87 dB
3	Tractor	1983	35 kW	84 dB
4	Tractor	1990	41 kW	82 dB
5	Tractor	1997	44 kW	-
6	Tractor	1986	47 kW	85 dB
7	Tractor	1990	47 kW	84 dB
8	Tractor	1994	47 kW	84 dB
9	Tractor	1983	51 kW	86 dB
10	Tractor	1983	51 kW	83 dB
11	Yard loader	1995	51 kW	-
12	Tractor	2001	55 kW	85 dB
13	Tractor	2001	72 kW	84 dB
14	Tractor	2008	73 kW	89 dB
15	Tractor	2009	84 kW	88 dB
16	Tractor	2004	101 kW	82 dB

Table II. Collected emission data from rural technical equipment and agricultural procedures (examples)

	Machine / Procedure
1	Milking system
2	Milk cooling System
3	Grain crusher
4	Flour mill
5	Integral fan mill
6	Corn mill
7	Mixing unit
8	Automatic feeding system
9	Fodder mixing vehicle
10	Elevator
11	Mixing Manure (Tractor in stationary operation)
12	Submersible mixer (storage facility open)
13	Submersible mixer (storage facility closed)

Table III. Collected emission data from animal husbandry. In total noise emissions from eight livestock species in different usage sectors were collected

	Species of livestock	Specific usage	Subarea
1	Cattles	Dairy cattle farming	
2		Suckler cow husbandry	
3		Cattle fattening	
4	Pigs	Fattening	
5		Breeding	
6	Chicken	Laying hens	
7		Fattening chicks	
8	Turkeys	Fattening	
9	Geese	Fattening	
10	Horses	Sport and recreational horses	
11			Stud station
12		Breeding	Breeding establishment
13			Young horse rearing
14	Sheeps	Milk sheeps	
15		Meat sheeps	
16	Goats	Milk goats	
17		Meat goats	

6. Weighted Emission Assessments

With a focus on pig farming an example for developing weighted emission assessments – including intensive and extensive emission phases – will be given hereinafter.

One hundred sound pressure level measurements were taken inside the stables of 33 pig farms. From an ethological point of view one can distinguish between “normal” and “emotional” vocalization phases. Emotional phases (e.g. feeding times) clearly form the minority but they are accompanied by more intensive vocalizations and higher emission levels. Phases with high as well as low noise emission levels were recorded. In addition data about the total surface of the stables, the sound absorption coefficient and the amount of animals kept in each stable were collected. From these basis data the SWL per pig for “normal situations”, the SWL per pig for “emotional situations” and the SWL max per pig were calculated. Combining the first two SWLs with the pig-specific-ethology (means: ratio of emotional to normal phases within the current assessment period) leads to weighted emission assessments.

7. Ethology

One of the main concerns in the development of the *Textbook of Sound Technology in Agriculture* was to give noise experts not only emission information of livestock husbandry but also to provide detailed facts to animal specific ethology. This knowledge should help experts who are not familiar with

farming to better understand the circumstances of animal noise emissions. Emissions are considered in context with functional circuits (social behaviour, rest behaviour, eating behaviour, movement, comfort behaviour, reproductive behaviour, excretory behaviour, play and exploratory behaviour) and specific production systems (e.g. dairy cattle farming or cattle fattening). It would be desirable that ethological explanations become an integrated part of noise expert assessments in the future.

8. Conclusions

The *Textbook of Sound Technology in Agriculture* represents a solid base for assessment of farm noise. It includes emission data from all important agricultural noise sources like traffic, rural technical equipment and farm animals. It is the first time that noise data from animal husbandry is available. With publishing the presented expert guideline a detailed prognosis of noise emissions and immissions originating from livestock farming is now possible.

Acknowledgement

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